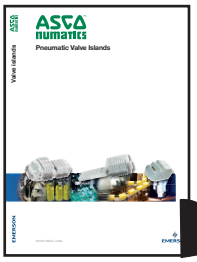
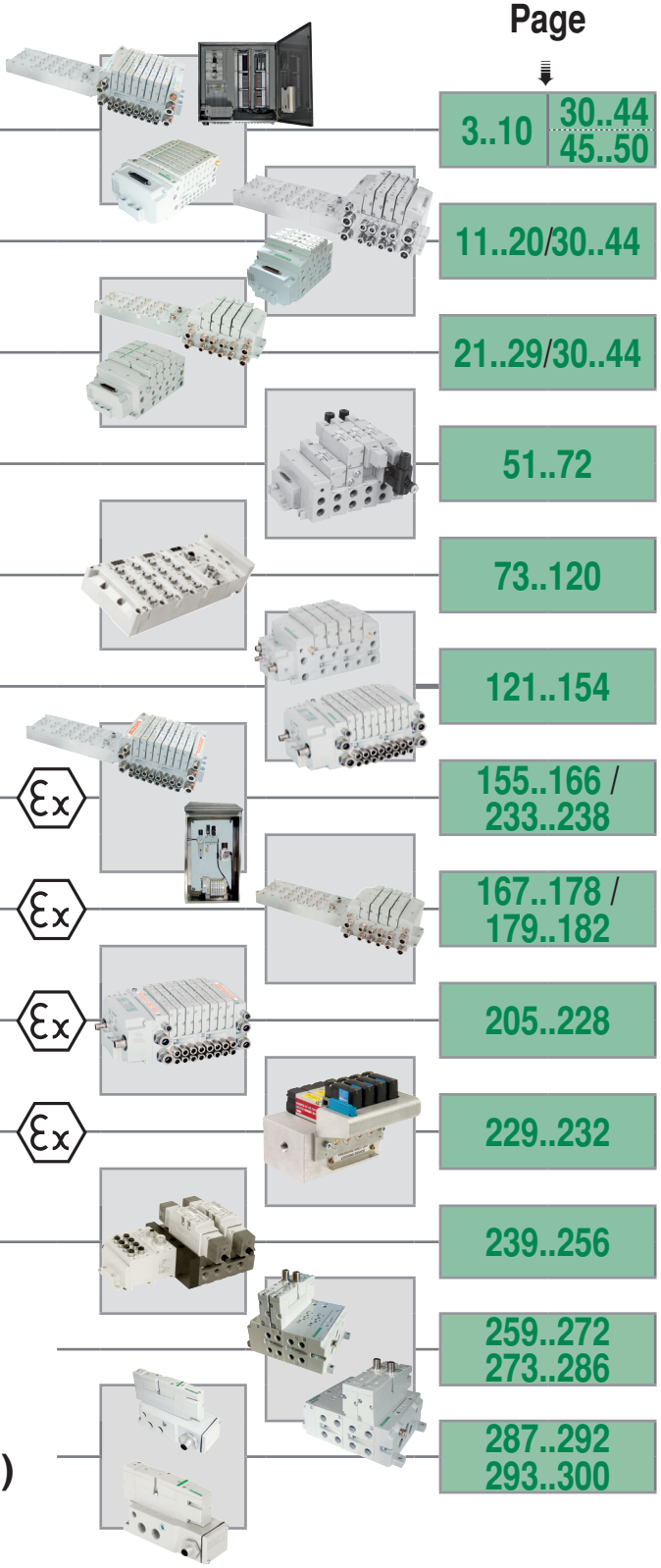
PNEUMATIC VALVE ISLANDS

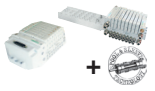
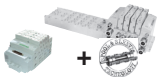
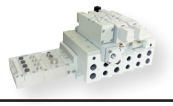


Consult the online configurator - CAD files on: **www.asco.com**



PNEUMATIC VALVE ISLANDS

Quick Selection Chart

ports/positions	pipe connections (ports 2 - 4: 4, 6, 8, 10, M7, 1/8, 1/4, 3/8, 1/2, 3/4 — ports 1 - 3 -5: 6, 8, 10, 12, 1/8, 1/4, 3/8, 1/2, 3/4 — ports 12-14: 6, M7, 1/8)	main operating pressure (bar)	flow at 6 bar ΔP 1 bar l/min (ANR)	series	illustration	cabinet mounting	transfert plate	Zoned Safety	I&M Sheet	page
Pneumatic valve islands, series 501, 502 and 503										
2 x 3/2 5/2 - 5/3		8	400	501 11 mm + Kits		-	●			3..10 / 30..44 - / -
2 x 3/2 5/2 - 5/3		8	650	502 18 mm + Kits		-	●			11..20 / 30..44 - / -
2 x 3/2 5/2 - 5/3		8	1400	503 26 mm + Kits		-	-	 ●	 -	21..44 -
2 x 3/2 5/2 - 5/3	Cabinet mounting	8	400	501 11 mm		●	-			45..50
Pneumatic valve islands, series 2035										
5/2 5/3		10	3820	2035 41 mm		-	-		-	51
G3 Electronics										
	Multipol *IP65* **Buslink** *DeviceNet™, EtherNet/IP™, Modbus TCP, PROFIBUS-DP®, PROFINET®, POWERLINK, CANopen®, EtherNet/IP™ DLR, EtherCAT®*			501 502 503 2035		● - - -	- - - -			73..120
580 Electronics										
2 x 3/2 5/2 - 5/3		8	400	580 (501)		●	●			121
2 x 3/2 5/2 - 5/3		8	650	580 (502)		● ●	● -			121
2 x 3/2 5/2 - 5/3		8	1400	580 (503)		●	-			121
Sub-Base Mounted Valves to ISO 5599/2										
5/2 - 5/3		16	1420 3165 5730	ISO1 ISO2 ISO3		- - -				239
Series 502 & 503 (M12) (ISO 15407-1 / ISO 15407-2 - 18 & 26 mm)										
2 x 3/2 5/2 - 5/3		10	500 1200 500 1200	502 503 502 503	ISO 15407-1		- - -	 		259 273 259 273
2 x 3/2 5/2 - 5/3		8	500 1200	502 503	ISO 15407-2		-	+		287 293

PNEUMATIC VALVE ISLANDS

Quick Selection Chart

ports/positions	pipe connections (instant fittings [O.D. (mm)] / internal thread (ØG)) — ports: 2 - 4	1 - 3 -5	12-14	main operating pressure (bar)	flow at 6 bar ΔP 1 bar l/min (ANR)	series	illustration	cabinet mounting	transfert plate	ATEX execution	I&M Sheet	page
Pneumatic valve islands, series 501 and 502												
2 x 3/2 5/2 - 5/3	4 6 8 10 M7 1/8 1/4 3/8 1/2 3/4	6 8 10 12 1/8 1/4 3/8 1/2 3/4	6 M7 1/8	8	400	501 11 mm		-	-	Ex		157
2 x 3/2 5/2 - 5/3	4 6 8 10 M7 1/8 1/4 3/8 1/2 3/4	6 8 10 12 1/8 1/4 3/8 1/2 3/4	6 M7 1/8	8	650	502 18 mm		-	-	Ex		167
2 x 3/2 5/2 - 5/3	Cabinet mounting			8	400	501 11 mm		●	-	Ex		233
Pneumatic valve islands, series 622												
5/2	4 6 8 10 M7 1/8 1/4 3/8 1/2 3/4	6 8 10 12 1/8 1/4 3/8 1/2 3/4	6 M7 1/8	8	600	622		●	-	Ex		229
G3 Electronics												
						501		●	-	Ex	-	157
						G3		-	-	Ex		181
	Multipol *IP65* **Buslink** *DeviceNet™, EtherNet/IP™, Modbus TCP,* *PROFIBUS-DP®, PROFINET®, EtherNet/IP™ DLR*					G3 ia NAMUR				Ex		99
						502		-	-	Ex	-	167
						G3		-	-	Ex		181
580 Electronics												
2 x 3/2 5/2 - 5/3	4 6 8 10 M7 1/8 1/4 3/8 1/2 3/4	6 8 10 12 1/8 1/4 3/8 1/2 3/4	6 M7 1/8	8	400	580 ATEX (501)		●	-	Ex		205
				8	650	580 ATEX (502)		-	-	Ex		

new

Series 501 valve platform

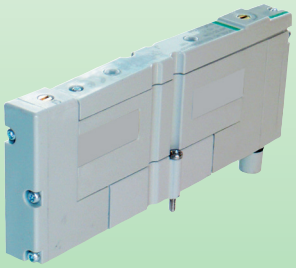
Page 45

\+

ATEX versions

Page 233

Plug-in Electrical connection

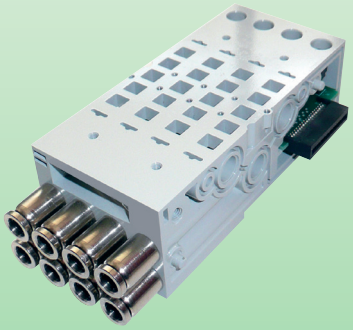


Plug-in valve

Page 3

Subbases

Fourfold Joinable



Pneumatic
pad mount
High flow
400 l/min ANR

End plates

With bottom ports

(11 mm)

Valves technology

Rubber packed
all pneumatic functions including double 3/2 NC and NO

Sandwich Accessories

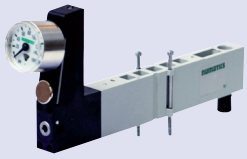
Plugged between valve and subbase:

Sandwich Speed Control

Shut off

Blank station plate

Pressure regulator



Multiwire or Fieldbus I/O Modules

Multiwire connection

599

or

G3/580 Electronics

I/O Module

Fieldbus

G3

580

580 Electronics

Assemblies

580 Electronics

Page 121

Page 205

CAD 3D 2D

Valve manifolds

Page 3

ATEX versions +

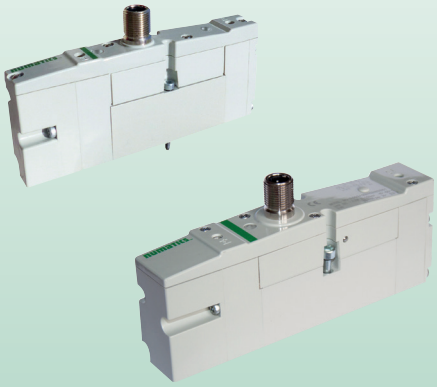
Page 205

new

Series 502 & 503 valve

M12 Electrical connection

M12 Valve
ISO 15407-1



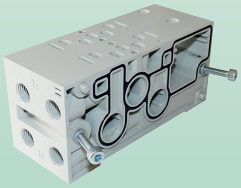
Pages 259 / 273

Subbases

Single

ISO 15407-1
502 : 500 l/min ANR
503 : 1200 l/min ANR

Double Joinable

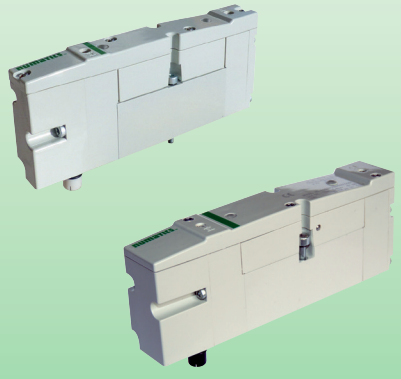


ISO 15407-1
502 : 500 l/min ANR
503 : 1200 l/min ANR

End plates

Side ports

Plug-in Electrical connection



Plug-in valve

Subbases

Single

Page 293 / 293

ISO 15407-2
502 : 500 l/min ANR
503 : 1200 l/min ANR

Double Joinable

Page 16 / 27

ISO 15407-2
502 : 500 l/min ANR
503 : 1200 l/min ANR

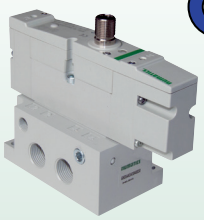
Pneumatic pad mount
High flow
502 : 650 l/min ANR
503 : 1400 l/min ANR

End plates

With bottom ports

platform (18 & 26 mm)

Assemblies



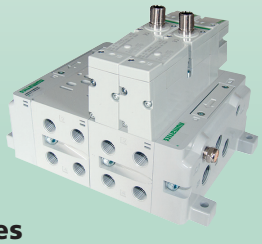
CAD 3D 2D

Page 259 / 273

M12 valve
on ISO 15407-1
single subbase

CAD 3D 2D

Page 259 / 273



M12 valves
on ISO 15407-1 joinable
subbases

Valves technology

Rubber packed
all pneumatic functions including
double 3/2

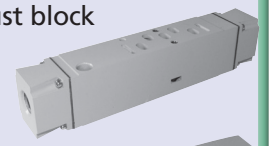
Spool & Sleeve
Very high life time > 200 M cycles

Sandwich Accessories

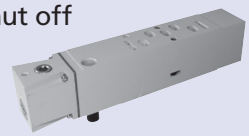
Plugged between valve and subbase:

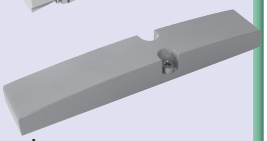
Sandwich
Speed Control

Exhaust block



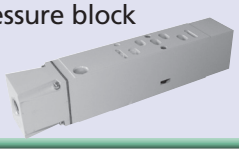
Shut off



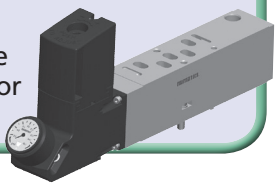


Blank
station plate

Pressure block



Pressure
regulator



Assemblies

Page 287 / 293

CAD 3D 2D

Valve
on ISO 15407-2
single subbase M12
electrical interface on
the subbase

580 Electronics

CAD 3D 2D

Page 121 (502 & 503)

\+ **ATEX versions** (502) *Page 205*

Multipol ou bus de terrain Modules E/S

Multiwire connection

599

or

G3/580 Electronics

I/O Module

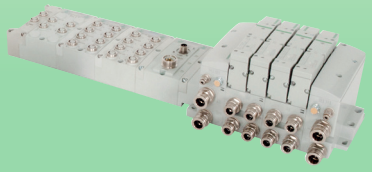
G3

Fieldbus

580

Page 11 / 21

CAD 3D 2D



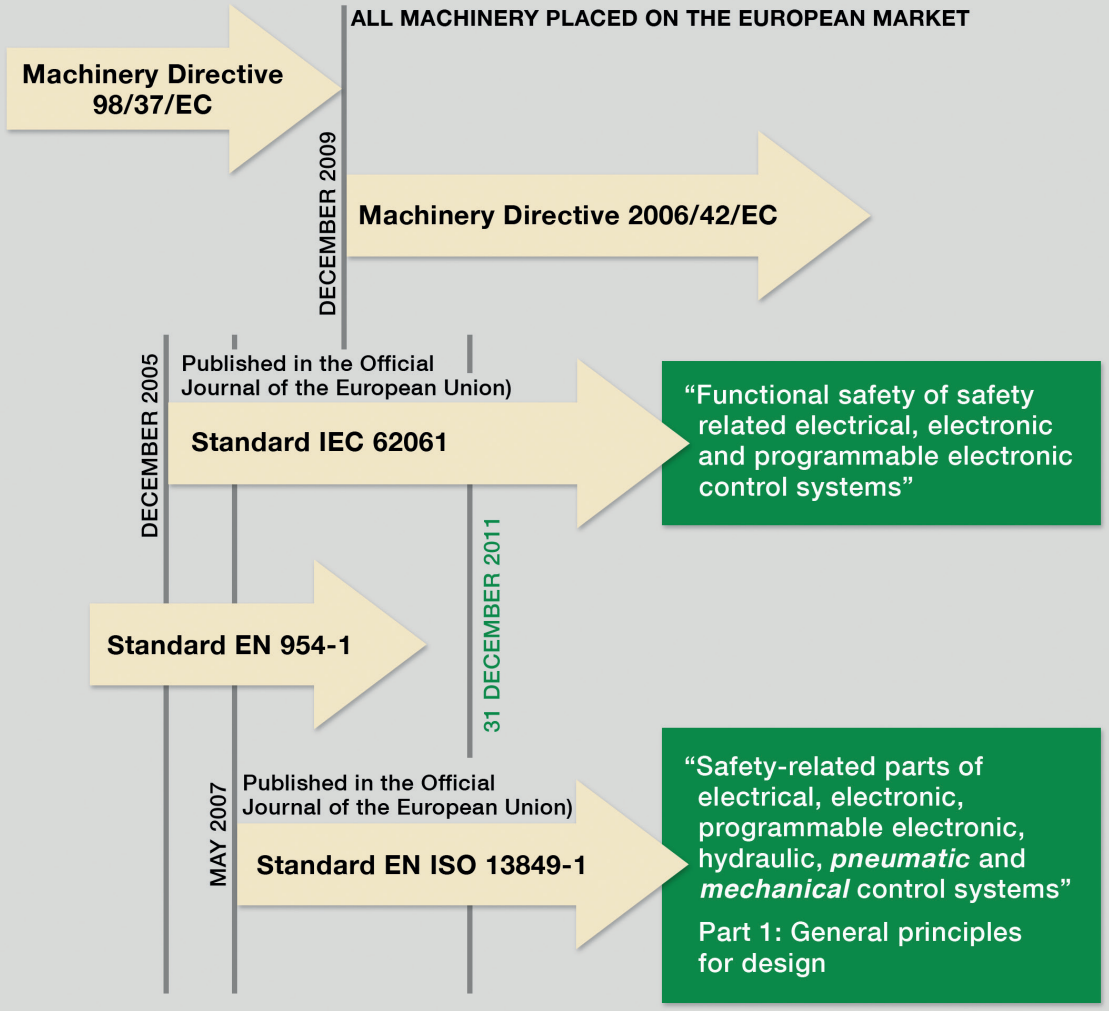
Valve manifolds

SAFETY OF MACHINERY

Principle of the Safety of Machinery:

To guarantee the safety and health of persons exposed to the installation, operation, adjustment and maintenance of machinery.

DEVELOPMENT OF THE STANDARDS



Three key concepts for the design of machinery and their safety functions have emerged from the implementation of the new Machinery Directive 2006/42/EC:

- A risk analysis prior to design
- A particular consideration of the quantitative aspect of the safety functions in addition to the qualitative approach
- The use of performance levels (PL)

Risk Evaluation:

The manufacturer or supplier of a machine must see to it that a risk evaluation is conducted to determine the health and safety requirements for persons involved in its operation. The machine must then be designed and constructed in accordance with the results of the risk evaluation.

RISK EVALUATION

"Good engineering practice + probabilistic calculations"

CONSTRUCTION AND RISK EVALUATION OF MACHINES

EN ISO 12100
Safety of machinery
Basic concepts, general principles for design

EN 1050 (EN ISO 14121-1)
Safety of machinery
Risk assessment - Part 1: Principles

Functional and safety-relevant requirements for safety-related control systems

Functional Safety Aspect

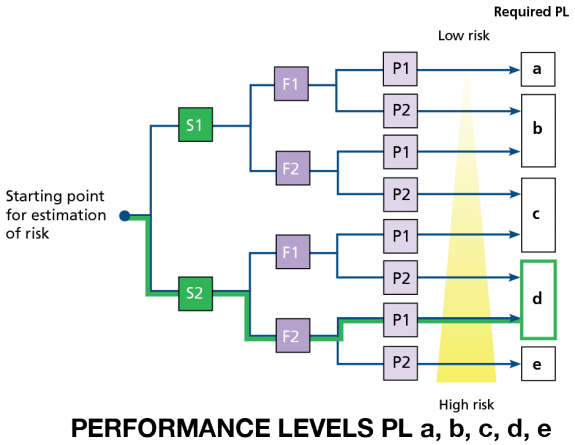
EN 60204-1
Safety of machinery. electrical equipment of machines - Part 1: General requirements

CONSTRUCTION AND RISK EVALUATION OF MACHINES

EN/IEC 62061 | **EN ISO 13849-1**

Risk related to the hazardous event = Severity of damage S and Frequency and/or duration of exposure F / Probability of occurrence O / Probability of avoidance P → Probability of damage

Effects	Severity S	Class K = F + O + P				
		3-4	5-7	8-10	11-13	14-15
Death, loss of eye or arm	4	SIL 2	SIL 2	SIL 2	SIL 3	SIL 3
Permanent, loss of fingers	3			SIL 1	SIL 2	SIL 3
Reversible, medical treatment	2	Other measures			SIL 1	SIL 2
Reversible, first aid	1					SIL 1



SAFETY INTEGRITY LEVELS SIL 1, 2, 3

PERFORMANCE LEVELS PL a, b, c, d, e

ANY ARCHITECTURE

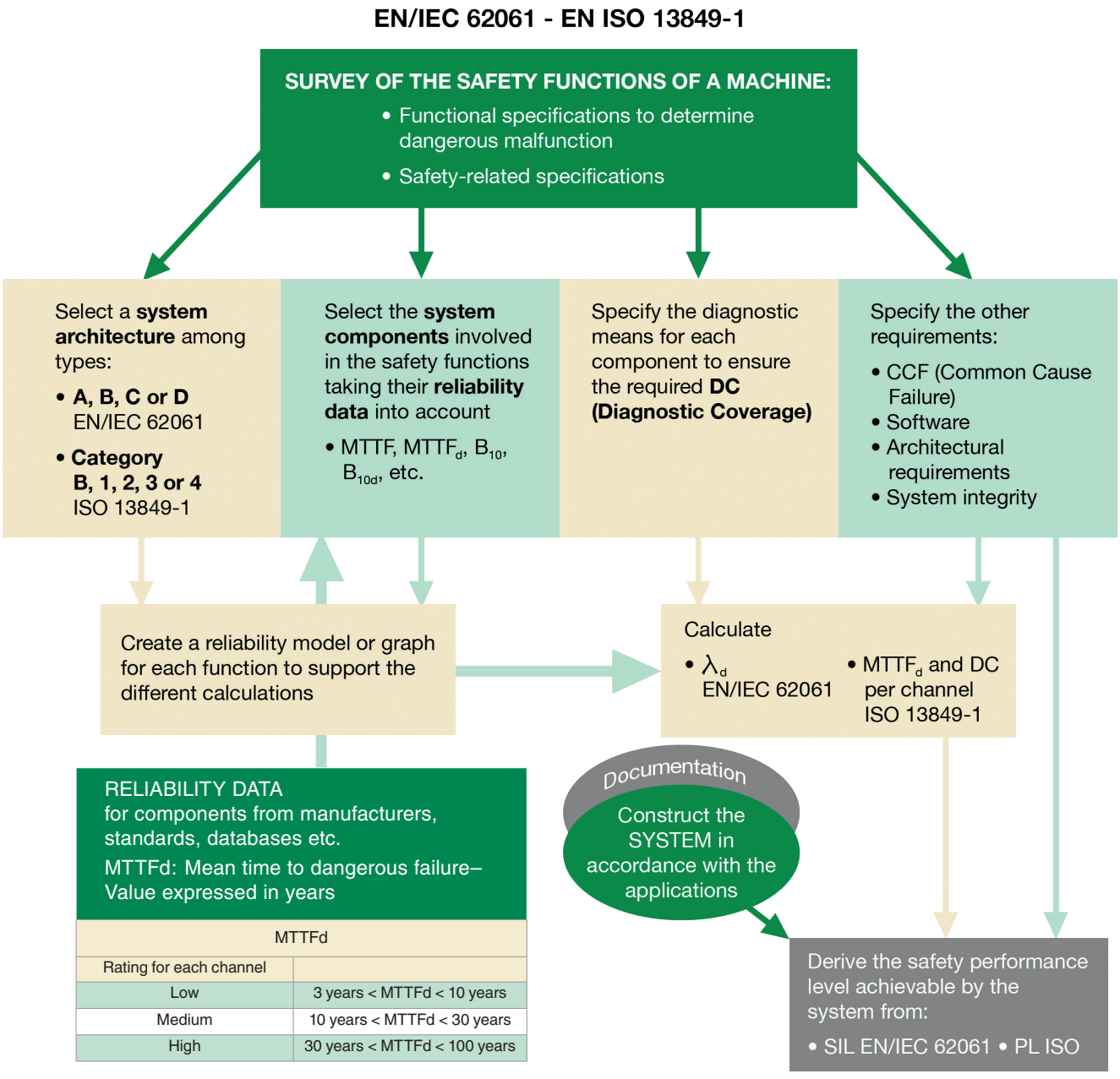
A → Series arrangement w/o diagnostic function
B → Parallel arrangement w/o diagnostic function
C → Series arrangement with diagnostic function
D → Parallel arrangement with diagnostic function

DESIGNATED ARCHITECTURE (CATEGORIES)

B,1 → Series arrangement w/o diagnostic function
2 → Series arrangement with diagnostic function
3,4 → Parallel arrangement with diagnostic function

DESIGN PROCESS

EN/IEC 62061 - EN ISO 13849-1



MTTFd	
Rating for each channel	
Low	3 years < MTTFd < 10 years
Medium	10 years < MTTFd < 30 years
High	30 years < MTTFd < 100 years

B_{10d}: Number of cycles after which 10% of a random sample of wearing components fail dangerously – Value expressed in number of cycles.

DC: Diagnostic Coverage

None	Low	Medium	High
DC < 60%	60% < DC < 90%	90% < DC < 99%	99% < DC

CCF: Common Cause Failure. Measures to be taken to prevent a given cause (and its effect) from concurrently disabling the multiple channels of a safety circuit.

Mission time T_{10}: In line with "good engineering practice" as recommended in EN ISO 13849-1, components attaining this value must be replaced (precautionary principle).

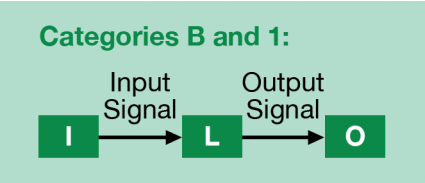
FOR YOUR SAFETY

Only the pneumatic part is described in the form of a subsystem in these examples. Other safety-related components (e.g. protective devices, electrical logic elements) must be added to ensure the safety function is complete.

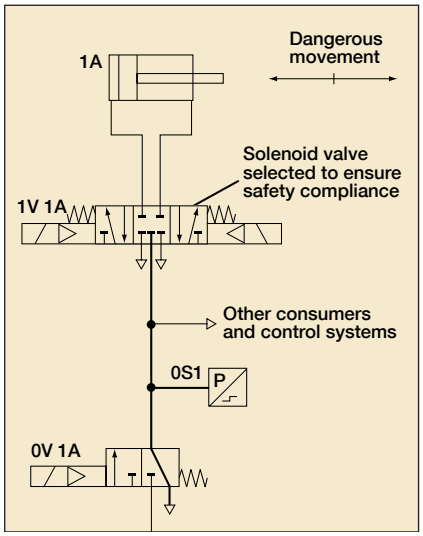
The examples shown here only relate to the stopping of hazardous movements. In pneumatics, safety measures concerning the interruption of energy sources, the evacuation of potential energy (pressure contained in a part of the circuit), and a “progressive” start-up after an unexpected shutdown should not be omitted.

To attain a PL = c, category 1 architecture

- Safety function: Stopping of the potentially hazardous movement of cylinder 1A.
- Functional description:



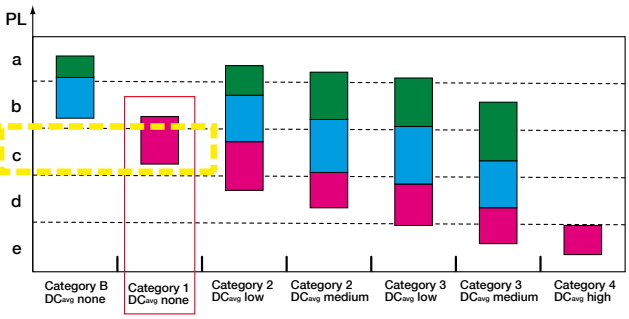
Input ‘I’: not represented, movable guard or light barrier, etc.Logic element ‘L’: not represented, PLC



- Calculation of the probability of dangerous failure:

1 cycle = 5 s	16 h	240 days	2,764,800 cycles

B_{10d} (1V1A – series 520) = 130,000,000 cycles, i.e. an operating time of 47 years, $MTTF_d$=470 years “high”



PL Performance Levels

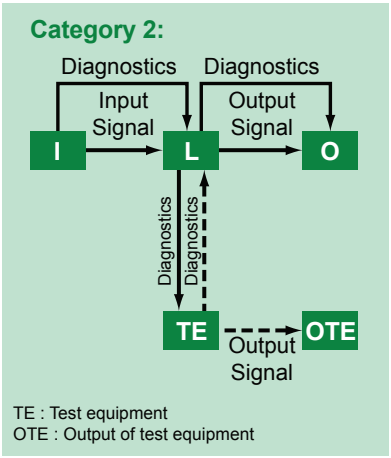
- $MTTF_d$ rating for each channel = low
- $MTTF_d$ rating for each channel = medium
- $MTTF_d$ rating for each channel = high

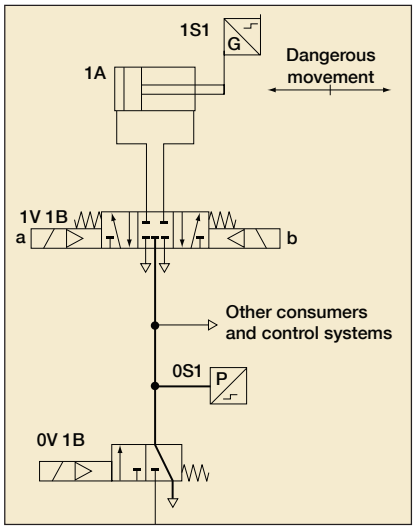
By limiting the valve’s operating time to 47 years, this corresponds to a PL = c

FUNCTIONS

To attain a PL = c, category 2 architecture

- Safety function: Stopping of the potentially hazardous movement of cylinder 1A.
- Functional description:





Input 'I': not represented, movable guard or light barrier, etc.Logic element 'L': not represented, PLC

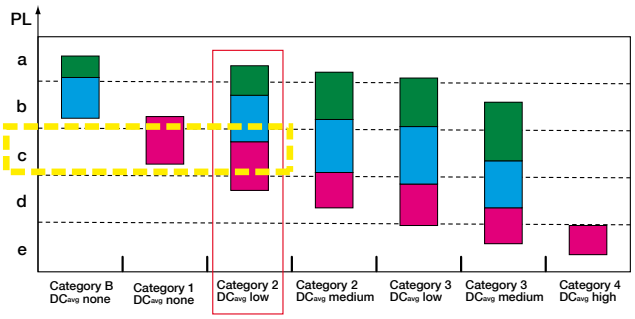
Output O: Valve 1V1B	Cross-monitoring in L1 of the supply status coherence of coils 1V1Ba and 1V1Bb and the limit switches 1S1

0V1: Energy isolating valve: ensures the system is exhausted in case of loop failure.

- Calculation of the probability of dangerous failure:

1 cycle = 5 s	16 h	240 days	2,764,800 cycles

B_{10d} (valve 1V1B - series 542) = 44,912,670 cycles, i.e. an operating time of 16.2 ans,
$MTTF_d$ = 162 years "high"
$MTTF_d$ (sensors 1S1) = 45 000 000h, i.e. 11,718 years "high"
The case study shows: DC (Diagnostic Coverage) = 60% "low"



PL Performance Levels

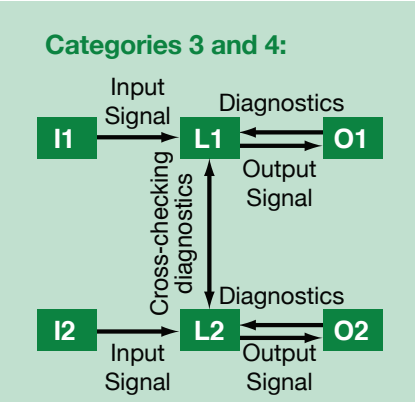
- $MTTF_d$ rating for each channel = low
- $MTTF_d$ rating for each channel = medium
- $MTTF_d$ rating for each channel = high

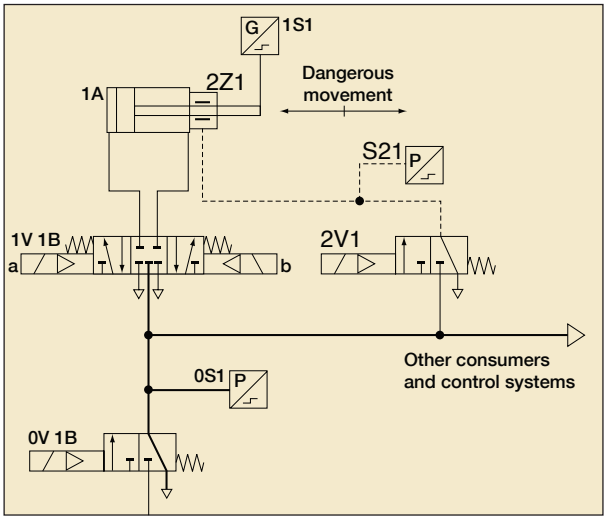
By limiting the valve's operating time to 16.2 years, this corresponds to a PL = c for the safety loop.

FOR YOUR SAFETY

To attain a PL = d, category 3 architecture

- Safety function: Stopping of the potentially hazardous movement of cylinder 1A.
- Functional description:





Inputs 'I1' and 'I2': not represented, movable guard or light barrier, etc.
Logic elements 'L1' and 'L2': not represented, PLC

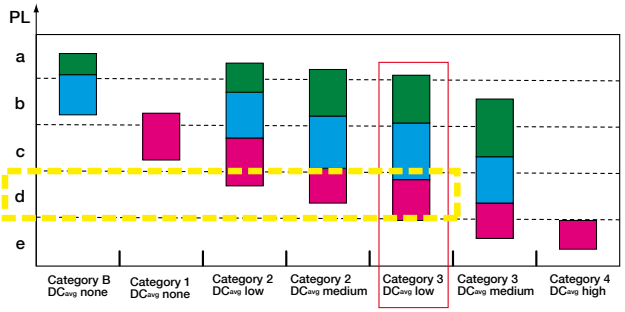
Output O: Valve 1V1B	Cross-monitoring in L1 of the supply status coherence of coils 1V1Ba and 1V1Bb and the limit switches 1S1	Cross-monitoring of L1/L2 status coherence within the PLC
Output O2: Valve 2V1 controlling the rod lock 2Z1	Pressure switch 2S1 for transmission of signal to L2	

0V1B: Energy isolating valve: ensures the system is exhausted.

- Calculation of the probability of dangerous failure:

1 cycle = 10 s	16 h	240 days	1,382,400 cycles

B_{10d} (valve 1V1B - series 542) = 44,912,670 cycles, i.e. an operating time of 32.4 years, $MTTF_d$ = 324 years "high"
B_{10d} (valve 2V1 - series 520) = 20,000,000 cycles, i.e. an operating time of 14.5 years, $MTTF_d$ = 145 years "high"
B_{10d} (pressure switch 2S1, dynamic rod lock 2Z1) = 4,000,000 cycles, i.e. a mission time of T10 = 2.89 years, $MTTF_d$ = 28.9 years "medium"
$MTTF_d$ (sensors 1S1) = 45,000,000 h, i.e. 11,718 years "high"
The case study shows: DC (Diagnostic Coverage) = 60% "low", DC (2V1) = 99% "high", DC* (2Z1) = 75% i.e. for channel O2, DC = 78% "low"



* "Good engineering practice" methods associate this type of component with a low-to-medium DC to cover any of the component's drift failures.

PL Performance Levels

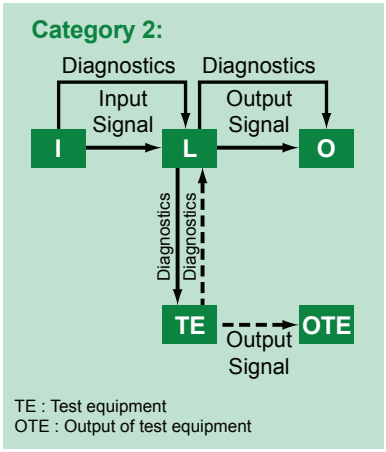
- $MTTF_d$ rating for each channel = low
- $MTTF_d$ rating for each channel = medium
- $MTTF_d$ rating for each channel = high

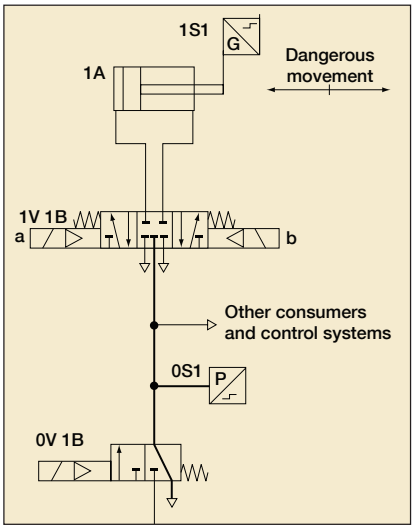
By limiting the operating time of the pressure switch and rod lock to 2.89 years, this corresponds to a PL = d for the safety loop.

FUNCTIONS

To attain a PL = d, category 3 architecture

- Safety function: Stopping of the potentially hazardous movement of cylinder 1A.
- Functional description:





Inputs ‘I1’ and ‘I2’: not represented, movable guard or light barrier, etc.
Logic elements ‘L1’ and ‘L2’: not represented, PLC

Output O: Valve 1V1B	Comparison in L1 of the supply status of coils 1V1Ba and 1V1Bb and the limit switches 1S1	Cross-monitoring of L1/L2 status coherence within the PLC
Output O2: Valve 2V1 controlling the two 2/2 "cylinder stop" valves used as braking units	Pressure switch 2S1 for transmission of signal to L2	

0V1B: Energy isolating valve: ensures the system is exhausted.

- Calculation of the probability of dangerous failure:

1 cycle = 10 s	16 h	240 days	1,382,400 cycles

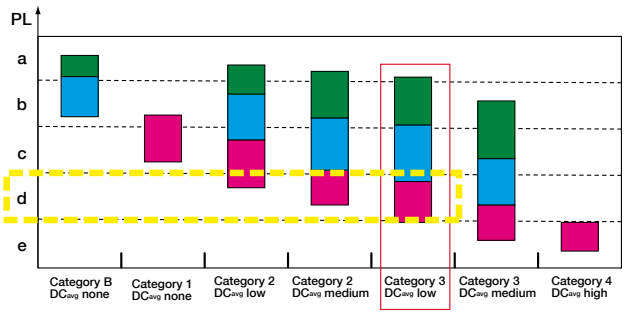
B_{10d} (valve 1V1B - series 542) = 44,912,670 cycles, i.e. an operating time of 32.4 years, $MTTF_d$ = 324 years “high”

B_{10d} (valve 2V1 - series 520) = 20,000,000 cycles, i.e. an operating time of 14.5 years, $MTTF_d$ = 145 years “high”

B_{10d} (pressure switch 2S1, dynamic rod lock 2Z1) = 4,000,000 cycles, i.e. a mission time of T10 = 2.89 years, $MTTF_d$ = 28.9 years “medium”

B_{10d} (2/2 cylinder stop valves 2V3, 2V2) = 60,000,000 cycles, i.e. MTTFd = 434 years “high”

The case study shows: DC (1V1B)=60% “low”, DC (2V1)=99% “high”, DC* (2V3, 2V2)=60%, i.e. for channel O2, DC = 78% “low”.



* “Good engineering practice” methods associate this type of component with a low-to-medium DC to cover any of the component’s drift failures.

PL Performance Levels

- $MTTF_d$ rating for each channel = low
- $MTTF_d$ rating for each channel = medium
- $MTTF_d$ rating for each channel = high

By limiting the operating time of the pressure switch and rod lock to 2.89 years, this corresponds to a PL = d for the safety loop.